We claim:

1. A fiber optic gyroscope comprising:

a loop including a single mode optical fiber having a first end and a second end;

a depolarizer region coupled to said loop, said depolarizer region including a first optical fiber section coupled to a second optical fiber section via a first splice and a third optical fiber section coupled to a fourth optical fiber section via a third splice, wherein said first optical fiber section is coupled to said first end of said loop via a second splice and said third fiber section is coupled to said second end of said loop via a fourth splice, and wherein said first, second, third and fourth fiber sections comprise polarization maintaining fibers;

said first splice having an alignment between 35^0 and 55^0 between a major axis of polarization of said first optical fiber section and a major axis of polarization of said second optical fiber section; and

said third splice having an alignment between 35^0 and 55^0 between a major axis of polarization of said third fiber section and a major axis of polarization of said fourth fiber section, whereby thermal and mechanical influences on the optical path lengths of each one of said optical fiber sections are substantially the same.

2. The fiber optic gyroscope of claim 1, wherein said first optical fiber section has a length y, said second optical fiber section has a length w, said third optical fiber section has a length z, and said fourth optical fiber section has a length x; and wherein $x + z$ is substantially equal to $w + y$.

3. The fiber optic gyroscope of claim 2, wherein w is substantially equal to $n * x$, and n is an integer.

4. The fiber optic gyroscope of claim 3, wherein $n = 2$.

5. The fiber optic gyroscope of claim 2, wherein $x + z$ is a length measuring between 6.5 meters and 7.5 meters.

6. The fiber optic gyroscope of claim 2, wherein each one of said first, second, third, and fourth optical fiber sections exhibit a beat length L_B, and wherein w is substantially equal to $2200L_B$, x is substantially equal to $1100L_B$, y is substantially equal to $800L_B$, and z is substantially equal to $1900L_B$.

7. The fiber optic gyroscope of claim 2, wherein w > x and z > y.

8. A method for minimizing time-derivative errors in a fiber optic gyroscope, the method comprising:

providing a depolarizer having two segments of polarization maintaining optical fiber coupled to an optical fiber loop, wherein the two segments are of substantially equal length;

providing each polarization maintaining optical fiber segment with two optical fiber sections connected together via a splice, each splice having an angle from about 35° to 55° between major axes of polarization of the corresponding pair of optical fiber sections; and

choosing the length of each optical fiber section to maintain thermal and/or mechanical symmetry of the optical fiber loop.

9. The method of claim 8, wherein the depolarizer is coupled to an integrated optical chip and the optical fiber loop.

10. The method of claim 8, wherein the optical fiber loop is a single mode optical fiber loop.

11. An inertial guidance system including a fiber optic gyroscope, the gyroscope comprising:

a light source having a short coherence length;

an integrated optic chip coupled to the light source;

a fiber loop having a fixed length; and

a depolarizer including two polarization maintaining fiber segments, each of said fiber segments including one or more splices and coupling a respective end of said fiber loop to the integrated optic chip, whereby mechanical and/or thermal symmetry is maintained and polarization errors are suppressed.

12. The inertial guidance system of claim 11, wherein said fiber loop comprises a coil of symmetrically wound single mode fiber measuring approximately 1000 meters in length.

13. The inertial guidance system of claim 11, wherein said integrated optic chip comprises a polarizer having blocking axis and a transmission axis, and a splitter which splits and modulates incoming light.

14. The inertial guidance system of claim 11, wherein one of said fiber segments includes a first section and a second section, said first section is coupled to said second section via a splice.

15. The inertial guidance system of claim 14, wherein the slice coupling said first section and said second section has an angle from about 35° to 55° between major axes of polarization of said first and second sections.

16. The inertial guidance system of claim 14, wherein another of said fiber segments includes a third section and a fourth section, and wherein said third section is coupled to said fourth section via a splice.

17. The system of claim 16, wherein said splice coupling said third section to said fourth section has an angle from about 35° to 55° between major axes of polarization of said third and fourth sections.

18. The inertial guidance system of claim 16, wherein said first section has a length y, said second optical fiber section has a length w, said third optical fiber section has a length z, and said fourth optical fiber section has a length x, wherein $x + z$ is substantially equal to $w + y$.

19. The inertial guidance system of claim 18, wherein w is substantially equal to $n * x$, and n is an integer.

20. The inertial guidance system of claim 19, wherein $n = 2$.

21. The inertial guidance system of claim 20, wherein $x + z$ is a length measuring between 6.5 meters and 7.5 meters.

22. The inertial guidance system of claim 18, wherein each one of said first, second, third, and fourth optical fiber sections exhibit a beat length L_B, and wherein w is substantially equal to $2200L_B$, x is substantially equal to $1100L_B$, y is substantially equal to $800L_B$, and z is substantially equal to $1900L_B$.

23. The inertial guidance system of claim 11, wherein said integrated optic chip comprises a polarizer and a splitter configured to split and modulate incoming light into ports, and recombine counter-rotating beams of light from said loop via said depolarizer.